THE MÜNSTER DEVONIAN TEAM

TM R.T. BECKER

Since the 2012 Report, research concentrated on the joint DFG-CNRST (Maroc) project on the comparison of Middle Devonian to Tournaisian faunas and facies developments north (Rhenish Massive and Saxothuringia) and south (Moroccan Meseta, northern margin of Anti-Atlas) of the Prototethys. The project is conducted in close co-operation with Ahmed EL HASSANI, Lahsen BAIDDER, EL Mostafa BENFRIKA, Fouad EL KAMEL, Mohammed RAJI, and Abdelfatah TAHIRI. D. BRICE agreed to identify Upper Devonian brachiopods, B. MISTIAEN stromatoporoids, and A. MAY corals. Project field work in spring 2012 concentrated on the Rehamna and Jebilet region, starting from Marrakech. A variety of upper Emsian goniatites were collected in the NE Jebilet. They give close similarities with the Anti-Atlas regions, whilst the same interval is reefal or clastic in most other Meseta regions. Below, the Daleje Event is well-developed as a package of poorly fossiliferous, thick black shale. All other visited outcrops are in neritic to reefal facies.

During the autumn field trip we were joined for one week by Christoph HARTKOPF-FRÖDER in order to add palynostratigraphy dates. The first week was dedicated to the Devonian successions of the Coastal Block, Oued Cherrat Valley, Mdakra and Khatouat regions. Localities N and ENE of Benahmed yielded unsuspectedly rich Frasnian and upper Famennian goethitic/hematitic ammonoid faunas. The Upper Frasnian of Boudouda has unique faunas that are astonishingly close to the famous German Buedesheim region (Eifel). The *Platyclymenia-Prionoceras* assemblages of the Oued Aricha have not been re-sampled since TERMIER & TERMIER (1951). The good new collections require a close comparison with the Tafilalt-Maider. The second part of the autumn field work led to the Azrou and Mrirt regions, as well as to Immouzer du Kandar tectonic window towards Fes (Fig. 1). We were impressed by the very massive conglomerates and breccias as evidence of polyphase Eovarioscan re-working in many sections. Cannibalized conglomerates clearly show that there were at least two major tectonic episodes, one probably still in the Givetian, one in the Famennian.

Fig. 1. The Eovariscan breccia at Immouzer du Kandar

Prior to the Rehamna and Jebilet work, Sven and the research students (Fig. 2) brought a minibus (which just survived) to the eastern Anti-Atlas. This part of the field field work concentrated on the northern Maider, "Southern Variscan Front" E of Tinerhir, and on the autochthonous Devonian near Tinejdad. At the same time additional sampling took place in sections selected for the revised mapping of the southern Tafilalt. Preparations for the 2013 Morocco Field Symposium required section labeling and re-sampling.

Fig. 2. The "Spring 2012 Morocco Team" from Münster, including Ahmed EL HASSANI, his wife, and our driver.

In summer 2012 our team organized a joint workshop with our Moroccan friends, including Harald TRAGELEHN, who contributed an update of Devonian stratigraphy in Franconia and Thuringia. Pierre BULTYNCK also came over to look through our material for a joint paper on Emsian conodonts from the Anti-Atlas. After a symposium with presentations by all project members, including all research students, a field trip led to the Devonian of the Aachen region, Eifel Synclines (using the guidance of Jan BOHATÝ), and Bergisch Gladbach (guided by Hans-Martin WEBER and Christoph). Most Devonian workers are not aware that the precise position of the Kacak Event and Eifelian/Givetian boundary in the Eifel Mts. is still largely unclear. In the Aachen region new conodont sampling shall unravel reef extinctions and the age of the "Grenzschiefer" with more precision. Unfortunately, many outcrops degrade fast since old quarries are used as dumps for building waste.

Other Devonian research includes the continuation of work on the rich Upper Devonian ammonoid faunas from the Canning Basin (involving research students) and co-operation with MA Xueping on interesting Famennian ammonoids from Xinjiang (NW China). A long monograph of the globally richest Upper Givetian goniatite assemblage, from Hassi Nebech in the SE Tafilalt, has been completed with Jürgen BOCKWINKEL (as first author) and includes Volker EBBIGHAUSEN, who is much missed. We intend to continue the Upper Givetian focus by the description of the pharciceratid fauna from the NW Maider. In the same context falls the joint description of the highly interesting new faunas from the Rudny Altai, together with Kolya BAKHAREV. There are at least three new genera in the Triainoceratacea (Fig. 3).

Fig. 3. A new early member of the Triainoceratidae from the Frasnian of the Rudny Altai (BECKER & BAKHAREV in prep.).

A short contribution on lower Emsian goniatites from Victoria (with C. EARP) has to wait for an important new monograph on the famous Hunsrück Slate ammonoids. Together with Svetlana NIKOLAEVA, a significant nomenclatorical problem, the validity of the species names of the Polish S.V. SOBOLEV, has been tackled and submitted to the International Commission on Zoological Nomenclature. Lower Carboniferous interests include additional rare goniatites and trilobites (given to Peter MÜLLER) from the Anti-Atlas, more Middle Tournaisian goniatites from El Atrous and Ain Aouda (Meseta), and the recovery of a second minute blastoid (for Jonny WATERS) from the Aguelmous Syncline. For activities at the D/C boundary see the Task Group Report in this issue.

CM Z.S. ABOUSSALAM

Intensive conodont sampling took place in the frame of the joint "Prototethys" project with our Moroccan friends. In the Meseta, primary tasks are the precise dating of reef growth and extinction, facies changes, and the timing of Eovariscan reworking events. Conodont faunas of Meseta localities are often relatively poor but even a few specimens were sufficient to show that various supposed Givetian reef limestones are in fact of Emsian or even Upper Visean age. Some of these results were presented at the 100th Anniversary Symposium of the Paläontologische Gesellschaft in Berlin. The complex conodont stratigraphy of the small-sized reef at Ain-es-Seffah (Oued Cherrat Valley) will be presented during the Morocco Field Symposium. Many other new data are also available for the reef complexes of the Coastal Block (Fig. 4), Al Attamna area, Mdakra, Mechra Ben Abbou region, Ain Jemaa (N of Oulmes), Tiflet, and High Atlas (Talmakent). Non-reefal successions were sampled for conodonts near Benahmed, Azrou, Mrirt, and in the Devonian of the Jebilet and Immouzer du Kandar window.

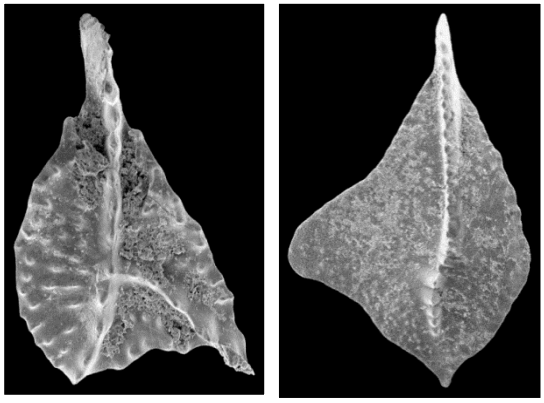

Fig. 4. Examples for new conodont records from the top Frasnian of Oulad Abbou (Coastal Block), western Meseta (*Ancyrognathus seddoni* and *Palmatolepis hassi*).

In the Rhenish Massive the stratigraphy at Blauer Bruch (Kellerwald) was further revised. Unfortunately, extreme condensation in the *hermanni* Zone excludes the section to become a GSSP candidate for the Upper Givetian substage. The Giebringhausen faunas are all identified but the manuscript needs further work. Samples from the Aachen region, Wülfrath, Dornap, and Hagen-Brilon reefs keep me busy, too.

In the Anti-Atlas research is continuing on Emsian (together with Pierre BULTYNCK), Eifelian-Givetian (Chotec and Taghanic Events), and Frasnian faunas. All M.Sc. and B.Sc. projects require conodont dating. For the revised mapping of the southern Tafilalt, both conodont plates and microfacies analyses were supplied. There are various new records of Lochkovian and Pragian taxa for southern Morocco.

CM S. HARTENFELS

continued field work in spring 2012 in the Tafilalt and Maider, with a focus on the upper and uppermost Famennian. IGCP 560 supported the attendance at the International Geological Congress in Brisbane, where the event facies of the Moroccan and German *Annulata* and Dasberg Events/Crises were reviewed. New data for the famous *Gonioclymenia* Limestone (Fig. 5) of the

Tafilalt were presented together with Thomas at the 100th Anniversary Meeting (IGCP 596 Symposium) in Berlin. Consistently different conodont faunas proved that the *Kalloclymenia* Limestone is a distinctive, slightly younger unit. It contains the "siphonodelloid" groups, which were previously recognized at Lalla Mimouna. An update for the conodonts of the latter section will be given at the 2013 SDS Field Symposium. There are also new data on the *Annulata* Events in the Rheris Basin (northern Tafilalt, section El Gara), which yielded some rare and new ammonoids. Results will be presented together with Thomas.

Fig. 5. The *Gonioclymenia* Limestone at Jebel Kfiroun South, W of Taouz, southern Tafilalt, with giant-sized corroded specimens of *G. speciosa*.

Research in the Rhenish Massive concentrated on the revision of the Ballberg section in the northern Sauerland. There are also Famennian conodont successions in wells and outcrops from above various reef sequences (of B.Sc/M.Sc. projects). In Franconia, co-operation with Harald TRAGELEHN continues. The previously announced, voluminous monograph of the extremely rich conodonts from Köstenhof (Schübelhammer) still requires more work on the text. A planned new DFG Project shall deal in detail with Famennian conodont diversity fluctuations. Sections from the Montagne Noire, Pyrenees, and South China shall be involved, too. A concentration on cyclic successions shall contribute to a better estimate of the variable Famennian conodont zone durations, which, of course, is currently an important bias in diversity estimates.

Ph. Students

Stephan EICHHOLT continued his comparisons of Givetian/Frasnian reef biofacies, sedimentology, and palaeoecology between the Moroccan Meseta and the Rhenish Massive. As a first step, the reefal development in the Oulmes region was documented (poster at Berlin IGCP Symposium). At the Morocco Field Meeting, results for the Oued Cherrat Valley will be presented. Field work in spring 2012 covered the Rehamna (Fig. 6), western Jebilet (Jebel Ardouz), and High Atlas (Talmakent). In the autumn more work was done on reefs of the Coastal Block and Mdakra regions. Reworked reef limestones in conglomerates and breccias of the Khtaouat, Azrou-Mrirt and Immouzer du Kandar Devonian were also sampled.

Stephan HELLING continued his trilobite studies. He identified new Pragian-Emsian material for the revised mapping of the southern Tafilalt and collected in spring 2012 new, important Frasnian phacopids and cornuproetines at Bou Tchrafine. Results were presented at the Berlin IGCP 596 Meeting in September. Another focus is the allochthonous Pragian Trilobite Limestone found in the Tinerhir region; first results will be available in spring 2013. Some new Middle/Upper Devonian phacopids collected by Thomas in 2011 in the Kuznetsk Basin are very different from contemporaneous forms of the western Prototethys. The previously mentioned manuscript on new Moroccan *Gerastos* (Proetinae) is still to be completed.

Fig. 6. View from the top of the Givetian reef limestone at Sidi Bou Talaa (Rehamna) on the adjacent river.

M.Sc. Students

Sören STICHLING started a M.Sc. on the Devonian stratigraphy and facies development at the northern margin of the Maider. It focuses on the two successions west and east of the more famous Ouihlane Syncline. Most interesting are the Givetian biostrome facies and major reworking units.

Marie RYTINA analyzes the allochthonous Silurian-Devonian olistoliths at the base of the thick Carboniferous succession just east of Tinerhir. This region belongs to the overall "Southern Variscan Front". The study will enable a reconstruction of Devonian sedimentation in the subsequently completely eroded regions north of the Maider. Preliminary results will be presented during the 2013 Field Symposium.

Dustin WARD logged and sampled the northernmost autochthonous Devonian of the Anti-Atlas at Oued Ferkhla (just NE of Tinejdad). It comprises a fine record of the Kacak and *pumilio* Events. Preliminary data will be presented in spring 2013. Based on ArcGis modelling, the succession will incorporated in new, more detailed isopach maps for the complete eastern Anti-Atlas.

Klaus SCHWERING started a M.Sc. on the spatial and stratigrapic distribution of sharks in the Devonian Morocco. His survey will be based on the systematic scanning of our conodont samples. It is already clear that early sharks had a very distinctive and uneven distribution in peri-reefal/biostromal, neritic to pelagic carbonates and at different times. The rarity/wide-spread lack of pre-Givetian sharks requires an explanation. German localities may be used for comparisons.

Tobias FISCHER started to compare the ontogenetic morphometry of upper/uppermost Famennian ammonoids from the Rhenish Massive, Franconia, and Anti-Atlas (Fig. 7). The Prionoceratinae became a focus since a previous B.Sc. suggested so far un-noticed major differences between representatives of the group from the north and south of the western Prototethys. This will lead to taxonomic distinctions and palaeobiogeographic implications.

B.Sc. Students

Nicola PUCK finished the mapping of the Devonian around the reefs of the Hofermühle region (Velbert Anticline, Rhenish Massive). Conodont dating of the reefs was very difficult but limited new evidence suggests that the long-known two local reefal belts were more or less contemporaneous. A separate, poorly known, mostly stromatolithic biostromal limestone occurs in the highest Frasnian and contains the last but rare rugose corals of the Rhenish Massive.

Timo GEHRLING will study a post-reefal succession in a well from the Wülfrath Reef area (Silberberg Quarry), as part of the successful co-operation with the Rheinkalk AG.

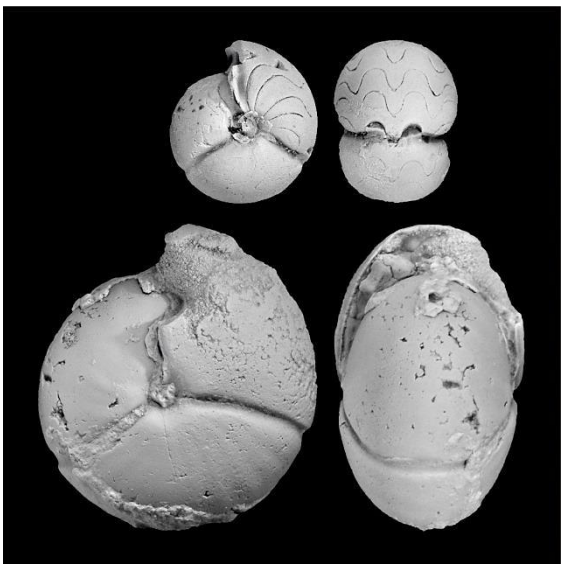

Fig. 7. Example for previously assumed *Mimimitoceras liratum* from the uppermost Famennian of the Maider (Bou Tlidat). The juvenile specimen shows evolute early whorls, unlike as in Rhenish topotypes from Drewer.

Publications

(For the long list of contributions to the Morocco Field Symposium see the Devonian Publications section)

BECKER, R.T. & NIKOLAEVA, S.V. 2012. Case 3600. A proposal to reinstate as available the species-group names proposed for Devonian ammonoids (Mollusca, Cephalopoda) by SOBOLEW (1914a, 1914b). – *Bulletin of Zoological Nomenclature*, **69** (3): 170-177.

BECKER, R.T., & GRADSTEIN, F.M. & HAMMER, O. 2012. *The Devonian Period*. – In: GRADSTEIN, F.M., OGG, J.G., SCHMITZ, M.D. & OGG, G.M. (Eds.), A Geological Time Scale 2012, Vol. **2**: 559-601, Amsterdam etc. (Elsevier).

BECKER, R.T., EL HASSANI, A. & TAHIRI, A. (Eds.) 2013. International Field Symposium "The Devonian and Lower Carboniferous of northern Gondwana", Field Guidebook. - *Document de l´Institut Scientifique, Rabat*, **27**: 150 pp.

BOCKWINKEL, J., BECKER, R. T. & EBBIGHAUSEN, V. 2013. Late Givetian ammonoids from Hassi Nebech (Tafilalt Basin, Anti-Atlas, southern Morocco). – *Fossil Record*, **16** (1): 5-65 + 58 pp. (online supplement).

BRETT, C.E., ZAMBITO, J.J., SCHINDLER, E. & BECKER, R.T. 2012. Diagenetically-enhanced trilobite obrution deposits in concretionary limestones: The paradox of "rhythmic event beds". – *Palaeogeography, Palaeoclimatology, Palaeoecology*, **367/368**: 30-43.

EL HASSANI, A., BECKER, R.T. & TAHIRI, A. (Eds.) 2013. International Field Symposium „The Devonian and Lower Carboniferous of northern Gondwana", Abstract Book. - *Document de l´Institut Scientifique*, Rabat, **26**:134 pp.

HAHN, G., MÜLLER, P. & BECKER, R.T. 2012.

Unterkarbonische Trilobiten aus dem Anti-Atlas (Marokko). – *Geologica et Palaeontologica*, **44**: 37-74.

Popular Science Contributions

HARTENFELS, S. & BECKER, R.T. 2012. *Conodonten – Zähne entfernter Verwandter der Wirbeltiere*. – In: MARTIN, T., von KÖNIGSWALD, W., RADTKE, G. & RUST, J. (Eds.), Paläontologie. 100 Jahre Paläontologische Gesellschaft: 78-79, München (Dr. Friedrich PFEIL).

BECKER, R.T. 2012. *Ein früher Ammoniten-Verwandter aus dem Rheinischen Devon*. – In: MARTIN, T., von KÖNIGSWALD, W., RADTKE, G. & RUST, J. (Eds.), Paläontologie. 100 Jahre Paläontologische Gesellschaft: 80-81, München (Dr. Friedrich PFEIL).

Abstracts

ABOUSSALAM, Z.S., BECKER, R.T. & EICHHOLT, S. 2012. Conodont dating of reefs and carbonate platforms in the Middle and Upper Devonian of the Moroccan Meseta. – In: WITZMANN, F. & ABERHAN, M. (Eds.), Centenary Meeting of the Paläontologische Gesellschaft, Programme, Abstracts, and Field Guides, 24.09. – 29.09.2012, *Terra Nostra*, **2012** (3): 27-28.

BECKER, R.T. & EICHHOLT, S. 2012. *Phylogeny and palaeogeography of the Beloceratidae from the Middle/Upper Frasnian of the Canning Basin (Australia).* - 34th International Geological Congress, Unearthing our Past and Future – Resourcing Tomorrow, Abstract CD: 3907.

BECKER, R.T., GRADSTEIN, F. & HAMMER, O. 2012. *Devonian Time Scale.* – GSA Annual Meeting, Charlotte, 4th – 7th November 2012, Abstracts and Programme.

EICHHOLT, S., BECKER, R.T. & STICHLING, S. 2012. Microfacies and development of the Devonian reef at Ain Jemaa (Moroccan Meseta). – In: WITZMANN, F. & ABERHAN, M. (Eds.), Centenary Meeting of the Paläontologische Gesellschaft, Programme, Abstracts, and Field Guides, 24.09. – 29.09.2012, *Terra Nostra*, **2012** (3): 47-48.

FISCHER, T. & BECKER, R.T. 2012. Palaeopathology and autecology of uppermost Famennian ammonoids from the Maider and Tafilalt Basins (eastern Anti-Atlas, southern Morocco). - In: WITZMANN, F. & ABERHAN, M. (Eds.), Centenary Meeting of the Paläontologische Gesellschaft, Programme, Abstracts, and Field Guides, 24.09. – 29.09.2012, *Terra Nostra*, **2012** (3): 54.

HARTENFELS, S. & BECKER, R.T. 2012. *Local variations of the global Annulata and Dasberg Crisis biofacies.* - 34th International Geological Congress, Unearthing our Past and Future – Resourcing Tomorrow, Abstract CD: 3719.

HARTENFELS, S. & BECKER, R.T. 2012. Conodont age and correlation of the transgressive *Gonioclymenia* and *Kalloclymenia* Limestones (Famennian, Anti-Atlas, SE Morocco). - In: WITZMANN, F. & ABERHAN, M. (Eds.), Centenary Meeting of the Paläontologische Gesellschaft, Programme, Abstracts, and Field Guides, 24.09. – 29.09.2012, *Terra Nostra*, **2012** (3): 67.

HELLING, S. & BECKER, R.T. 2012. New proetid and phacopid trilobites from the Middle Frasnian (Upper Devonian) of the Tafilalt (Anti-Atlas, SE Morocco). - In: WITZMANN, F. & ABERHAN, M. (Eds.), Centenary Meeting of the Paläontologische Gesellschaft, Programme, Abstracts, and Field Guides, 24.09. – 29.09.2012, *Terra Nostra*, **2012** (3): 73.

MA, X., ZONG, P., BECKER, R.T., ZHANG, Y. & ZHANG, M. 2012. *Famennian stratigraphic and faunal sequence of western Junggar, northwestern China.* – 34th International Geological Congress, Unearthing our Past and Future – Resourcing Tomorrow, Abstract CD: 3258.

NOWAK, H., BECKER, R.T., ABOUSSALAM, Z.S. & HARTENFELS, S. 2012. *Facies development and death of the Devonian Wülfrath Reef (northern Rhenish Massif, Germany).* – 56th Palaeontological Association Annual Meeting, 16-18 December 2012, University College Dublin: 81.

Recent Theses

EICHHOLT, S. 2011. *Phyletischer Gradualismus bei Beloceratiden (Agoniatitida, Gephuroceratacea) des tiefen Oberdevon: Morphometrie und Taxonomie.* – M.Sc. Thesis, WWU Münster, 125 pp.

HELLING, S. 2011. *Devonische Trilobiten aus dem Anti-Atlas (S-Marokko) – Taxonomie, Morphometrie und Biostratigraphie.* – M.Sc. Thesis, WWU Münster, 158 + 44 pp., 12 pls.

NOWAK, H. 2012. Paläoökologie und Faziesanalyse des devonischen Riffkomplexes von Wülfrath. – M.Sc. Thesis, WWU Münster, 49 pp., 17 pls.

PUCK, N. 2012. *Geologische Kartierung im Bereich der Riffe von Hofermühle (Blatt Heiligenhaus, Bergisches Land, NRW).* – B.Sc. Thesis, WWU Münster, 41 pp., 6 maps.

SCHWERMANN, K. 2011. *Exotische Riffbildner im pelagisch geprägten Mitteldevon (Givetium) des östlichen Dra-Tals (Marokko).* – B.Sc. Thesis, WWU Münster, 20 pp., 9 pls.

STICHLING, S. 2011. *Stratigraphie und Fazies der Bohrung B102 im Raum Hönnetal (Nord-Sauerland).* – B.Sc. Thesis, WWU Münster, 67 pp.

TEMMESFELD, F. 2011. *Stratigraphie und Mikrofazies des Famenniums am Ballberg bei Hövel im Sauerland.* – B. Sc. Thesis, WWU Münster, 43 pp.